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ORIGINAL ARTICLE

Acupuncture in the Management of Acute Dental Pain

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Abstract
Acute dental pain is the main reason for seeking dental services to provide urgent dental care; there is consensus about the use of alternative therapies, such as acupuncture, to control dental pain in pre-dental care. This study aimed to evaluate the use of acupuncture in reducing the intensity of acute dental pain in pre-dental care in patients waiting for emergency dental care, and was conducted at the After-Hours Emergency Dental Clinic of Piracicaba Dental School, and at the Emergency Center Dental Specialties I in Piracicaba, São Paulo, Brazil. The sample consisted of 120 patients. The Visual Analog Scale (VAS) was used to measure pain intensity. All patients underwent one session of acupuncture; the points LI4, ST44 and CV23 were selected and were used alone or in combinations. Reduction in pain was observed in 120 patients (mean initial VAS $= 6.558 \pm 1.886$, $p < 0$; mean final VAS $= 0.962 \pm 2.163$, $p < 0.00001$). The results of this study indicate that acupuncture analgesia could be a technical adjunct to pain control in patients with acute dental pain, contributing to the restoration of health with social benefit.

1. Introduction

Acute dental pain, experienced by many people, without distinction of sex, age, or race, is the most common reason for the demand for health care, especially urgent dental care provided at emergency care centers [1].

Pain is considered a common symptom of an oral condition [2], and to control it, there is consensus about the use alternative therapies combined with conventional treatment. Conventional treatment for acute dental pain management involves diagnosis of the condition causing the pain, dental treatment, and drugs [3]. Two groups of drugs

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are used: non-narcotic analgesics, including anti-inflammatory steroids, non steroidal anti-inflammatory drugs (NSAIDs, e.g., ibuprofen, aspirin, mefenamic acid) and paracetamol (acetaminophen) and narcotics (e.g., tramadol) [3,4].

At present, acupuncture is an alternative therapy [5], the value of which has been recognized as a treatment for pain [6,7]. In the Geneva WHO 2003 report, pain in dentistry, including dental pain, facial, and postoperative pain, were listed among the conditions for which acupuncture appears to be an effective treatment [8,9].

No scientific literature was found on the use of acupuncture in the management of acute dental pain in pre-dental care, among the clinical trials published in the past 10 years. However, in a systematic literature review [10], according to data analysis, acupuncture can be effective in relieving dental pain, either during surgical procedures or after surgery.

Acupuncture involves inserting thin needles in some points on the surface of the body, known as acupuncture points, in order to obtain a therapeutic response, with the aim of treatment and prevention of disease [11].

When a needle is inserted into the acupoint, a specific feeling called *De qi* is felt, which can present as pain, numbness, heat, weight, or distention around the area where the needle was inserted, and this feeling can radiate along the path of the meridian that belongs to the point stimulated. It is a desired and necessary effect for acupuncture to be effective [12,13].

The exact mechanism of action of acupuncture has not yet been established [13]. According to the literature [14], inserting a needle into an acupoint creates a small inflammatory process, with the release of neurotransmitters such as bradykinin and histamine. Then, the stimuli are conducted to the central nervous system through the thick and myelinated A-delta fibers, and the thin and unmyelinated C fibers, located in the skin and muscles. When the stimuli end on the posterior horn of the spinal cord, they stimulate enkephalinergic neurons, through synapses, to release enkephalin, a blocker of substance P (a neurotransmitter that stimulates pain), thus inhibiting the pain sensation. The stimuli continue mainly through the lateral spinothalamic tract until the brainstem, releasing serotonin, which is responsible for increased levels of endorphin and ACTH (adrenocortical hormone), and increasing cortisol in the adrenal glands, thus ensuring the beneficial effect on the patient's stress and anxiety [14].

Acupuncture is considered a safe procedure [12], if performed by a professional with proper training [5,11,14,15]. It is a natural, low cost therapeutic resource, which has an advantage, because the use of conventional drugs to treat acute dental pain can have adverse effects such as stomach ulcers and bleeding problems (ibuprofen), dizziness, constipation, sleep disorders (tramadol) [4], and hives, skin rashes, and blood dyscrasias (paracetamol) [3].

Acupuncture does not replace conventional surgical procedures [14]. According to current evidence suggesting that acupuncture is effective as a symptomatic treatment of dental pain [16], its use in pain patients awaiting dental care generates a social benefit and improves the patient's physical and emotional condition, thereby contributing to the success of the professional service.

In view of the foregoing discourse, the objective of this study was to evaluate the effect of acupuncture on reducing acute dental pain in patients awaiting care at the after-hours emergency dental care centers.

2. Material and methods

This study was conducted at the after-hours emergency dental care center of the Piracicaba Dental School, University of Campinas and at the Emergency Center Dental Specialties I in Piracicaba (São Paulo), from September 2009 to July 2010.

The study was conducted in accordance with ethical criteria, in compliance with the standards required by the Declaration of Helsinki and was approved by the Research Ethics Committee of the Piracicaba Dental School FOP/UNICAMP (number 020/2009).

A convenience sample was used, which included all patients with acute dental pain, who were waiting for dental care, aged between 18 years and 90 years and who agreed to participate in the study by signing the terms of free and informed consent. Pregnant women and patients participating in other researches were excluded from the sample.

The survey was carried out in the dental office of the emergency dental care centers, prior to the activities of doctors on duty began. To undergo the procedure, the patient was accommodated in the dental chair. After acupuncture, all patients were asked whether they would recommend the procedure to another patient in the same situation.

During the study, the intensity of pain reported by patients was measured by a Visual Analog Scale (VAS), ranging from 0 (VAS 0 = no pain) to 10 (VAS 10 = maximum pain); the initial VAS score was measured at the time of invitation to participate, and the final VAS score, on completion of the acupuncture treatment.

The acupoints selected for the study were according to the therapeutic indication, related to orofacial pain and dental pain, according to Traditional Chinese Medicine (TCM).

2.1. Description of points

LI4 (Hegu): fourth point of the large intestine meridian (LI), located in the back of the hand; point of analgesia in painful disorders of the face and teeth. It is a point of great analgesic importance [17]. In its internal pathway, the meridian is strongly associated with the oral cavity.

ST44 (Nei Ting): penultimate point of the stomach meridian (ST), located in the foot, between the second and third metatarsal; indicated for toothache and in the reduction of edema. The stomach meridian runs through the area around the mouth, mandible, and gums of the maxilla [18].

CV23 (Lian Quan): penultimate point of the conception vessel. It is located in the midline of the ventral depression above the hyoid bone, with the patient sitting with the neck in extension; indicated for facial pain [18].

Points elected were used individually or combined, with the aim of reducing the intensity of acute dental pain (VAS).

2.2. Application of the acupuncture

(1) Note the initial VAS.
(2) Inserting a needle into one of the points to get the feeling of *De qi*, after the patient reports the *De qi* sensation the final VAS was noted and the point used.
(3) In the case of VAS = 0, indicating no pain, the needle was removed and acupuncture was concluded.
(4) In cases where there was a reduction in pain, but VAS > 0 remained, or the pain remained the same, the first needle remained in the insertion site and another needle was inserted into one of the two remaining points elected to obtain a *De qi*. After the patient reported the *De qi* sensation, the final VAS was noted.
(5) Similarly, in the case of VAS = 0, indicating no pain, the needle was removed and acupuncture was concluded.
(6) If, after association of the second point in the cases of VAS > 0, a third needle was inserted at the last point, associated with the two preceding points, acupuncture was applied and the VAS was recorded in the same way as in the two previous points, thus ending the acupuncture application, even if the VAS was > 0 (Fig. 1).

There was no manipulation of the acupuncture needle (dispersion or tonification). In patients who did not report feeling the *De qi*, the needles remained in place for 5 minutes.

The choice of point to begin the acupuncture was random, and so was the sequence of association of the points.

In cases of acute pain, acupuncture at the points with significant analgesic effects (LI4, ST44) provided relief in a short time [17].

Needle insertion was unilateral on the side of the referred pain and for patients who reported pain in more than one tooth on both sides. The needle was inserted on the side with the severest pain, and the initial VAS recorded was equivalent to the pain of higher intensity.

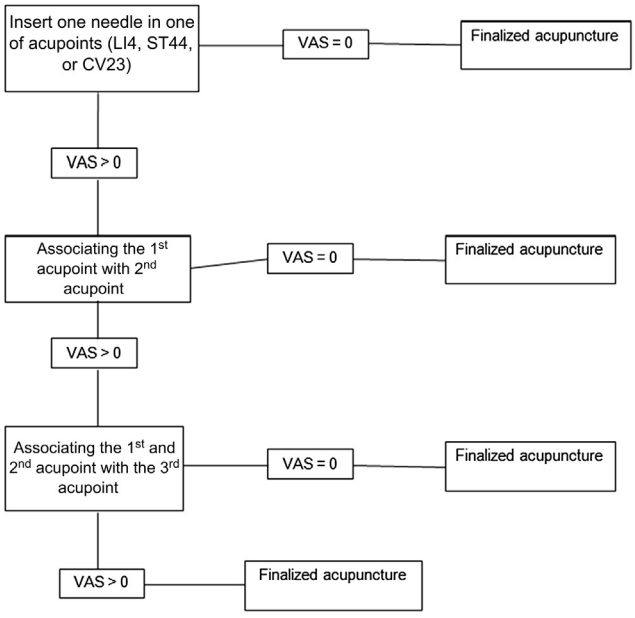

Figure 1 Sequence of application of acupuncture in this study.

At the LI4 and ST44 points, needle insertion was perpendicular, and at the CV23 point, it was inserted toward the base of the tongue [18].

The depth of needle introduction was appropriate to the points, respecting the physical constitution, the patient's age, and the location of the point [19].

The needles used were disposable, sterile, individually packed, 0.25 × 25 mm in size, stainless steel, Huan Qiu brand (Suzhou Huanqiu Acupuncture Medical Appliance Co. Ltd., Suzhou, Jiangsu, China). Prior to the placement of needles, skin antisepsis was performed with 70% alcohol and cotton. The researcher is an experienced acupuncturist.

After acupuncture application, all patients were instructed to remain in the waiting room and wait for dental treatment.

2.3. Statistical analysis

The statistical analysis was performed using Microsoft Office Excel 2007. First, a descriptive analysis of the variable under review (VAS) was made, to obtain the absolute and percentage distribution, mean and median, and standard deviation (SD), initial VAS and VAS after acupuncture. Differences between responses were evaluated by ANOVA, followed by Tukey's test [20]. Statistical differences were considered significant at $p < 0.05$.

2.4. Main outcome measures

The main outcome measure was pain intensity, measured by VAS. The secondary measure was to achieve VAS = 0; for this purpose, we added each acupuncture point to evaluate the response by the differences between Group 1 (one acupuncture point), Group 2 (2 acupuncture points), and Group 3 (3 acupuncture points).

3. Results

One hundred and twenty patients participated in the survey, aged from 18 years to 71 years, mean age of 35 years (35.82 ± 11.98). Out of the total number of patients invited to participate in the study ($n = 317$), there was a loss of 62.14% ($n = 197$) from the sample, because 145 patients were without pain at the time of the invitation, 29 patients had pain and were afraid of the acupuncture needle, 22 patients with pain did not disclose the reason for refusal, and one patient with pain refused to participate because without pain, it would not be possible to tell the dentist which tooth was causing the problem.

Acupuncture significantly decreased the pain intensity (mean pain value at baseline = 6.558 ± 1.875 and after intervention, mean = 0.963 ± 2.164); the *t* test was applied, based on the initial VAS and final VAS scores (measured in the same individual) to obtain a value of $p < 0.00001$; there was a significant reduction in pain. In all groups, there was a reduction in pain, which can be verified by observing the mean values (Table 1). The group of patients who needed one point ($n = 29$) to obtain VAS = 0, on

an average, had a lower initial VAS score than the group of patients who needed 2 points ($n = 43$), and these in turn, had a lower mean initial VAS score than the group who needed three points ($n = 33$).

The mean pain reduction scores prior to and after the application of acupuncture at one point, was statistically significant ($p < 0.0001$). Based on these results, the application of acupuncture differs statistically from point to point. At point LI4, we found the largest decrease in pain assessed prior to and after application of acupuncture; at point CV23, pain reduction was greater than at point ST44, but smaller than at point LI4; and at point ST44 we found less reduction in pain compared with the other points (Table 2).

As regards the patients who participated in the study, 77 (64.17%) were women and 43 (35.83%) were men (Table 3).

Only 2.5% of patients did not respond to acupuncture, irrespective of the starting point and of the sequence used.

In the total sample, 119/120 patients (99.17%), would recommend acupuncture treatment to relieve acute dental pain in dental pre-care to another patient in the same situation and 1/120 (0.83%) would not recommend it.

Table 2 Mean pain reduction prior to and after application of acupuncture in a point.

Point	Mean difference in pain prior to and after
ST44	1.5000*
CV23	2.8333*
LI4	3.9149*

*Points differed statistically, according to Tukey's test ($p < 0.005$).

4. Discussion

The results of this study indicated that acupuncture reduced pain intensity (VAS = 0), in 72.50% of patients with acute dental pain, awaiting care in an emergency dental care center.

The point LI4 (Hegu) had a better analgesic effect ($p < 0.0001$), as in other studies [7,13,15,21]. Although it is located in the hand, LI4 is frequently used for pain control in cases of oral and craniofacial surgery, because of its analgesic value in dental-facial pain [12,22,23].

According to Chinese medicine, pain can be caused by stagnation of *Qi* [24], thus the LI4 acupoint was selected because it is an important point of analgesia [17], and because the main pathway of its meridian (large intestine) Yang Ming (hand), its secondary path which passes through the mandible and maxilla and the meeting point Yuan [18,24], are used in order to relieve the obstruction of meridians and collaterals, promoting the free flow of *Qi* and thereby eliminating pain [24].

The needling of a specific point contributes to the relief of pain, and the location of the stimulus determines the therapeutic effect and physiological response [25]. Each point has a specific function and indication for its use. For example, stimulation of certain acupuncture points distant from the source of pain can provide excellent analgesia, whereas stimulation of improperly selected points near the source of pain may be ineffective or even aggravate the symptoms [13].

With technological advances in neuroimaging, a study [7] with acupoint LI4 using magnetic resonance imaging (fMRI), concluded that acupuncture can decrease the activity of regions of the brain, disabling the limbic system that relates to pain perception, however the small sample size is a limitation of the study.

LI4 was the point used in a study [22] involving maxillofacial surgery, in which the selection of points was performed individually by selecting distal points and those that passed next to the surgery site. Acupuncture was performed prior to, during, and after surgery, and the authors concluded that acupuncture analgesia can be a supplement to conventional anesthesia in maxillofacial surgery.

We found no previous studies that used the CV23 point for acute dental pain. This was one of the points used in a study [22] on the use of acupuncture anesthesia combined with techniques for performing maxillofacial surgery. The results suggested that the application was appropriate for this association with clinical surgery for the relief of postoperative pain, because of the technical simplicity and low cost. In this study, a reduction in the intensity of acute dental pain was shown, demonstrating the therapeutic effect of acupuncture

Table 1 Mean, standard deviation, first quartile, and third quartile of initial Visual Analog Scale (VAS), of final VAS, and according to the number of points applied.

Pain	Number of points	Mean	Standard deviation	1° Quartile	Median	3° Quartile
Initial ($n = 29$)	1	5.6896	1.7341	5	6	6
Initial ($n = 43$)	2	6.3488	1.6018	5	6	7
Prior to 2 points	2	3.6744	1.8480	2	3	4.5
Initial ($n = 15$)	3	6.8333	2.3350	5	7	8.75
Prior to 2 points	3	4.9333	1.9988	3.5	4.5	6.25
Prior to 3 points	3	2.4333	1.8113	1.25	2	3
Initial ($n = 33$)	>3	7.4697	1.7497	6	8	9
Prior to 2 points	>3	6.1061	2.0262	5	6	8
Prior to 3 points	>3	4.7879	2.0001	3	4	6
After 3 points	>3	3.5000	2.8723	1	2	6

Table 3 Number and percentage of patients without pain (VAS = 0) and with pain (VAS > 0), after application of 1, 2 ,and 3 points, according to gender.

Pain	After application	Points applied*	Female	Male	Total of patients (M+F)	%
VAS = 0		1	13	8	21	17.50
	1 point	2	0	0	0	0.00
		3	7	1	8	6.67
	Subtotal		20	9	29	24.17
		1—2	2	0	2	1.67
		1—3	7	4	11	9.17
	2 points (sequence)	2—1	5	1	6	5.00
		2—3	4	3	7	5.83
		3—1	4	3	7	5.83
		3—2	8	2	10	8.33
	Subtotal		30	13	43	35.83
		1—3	1	2	3	2.50
		1—3—2	0	1	1	0.83
	3 points (sequence)	2—1—3	1	1	2	1.67
		2—3—1	1	1	2	1.67
		3—1—2	1	1	2	1.67
		3—2—1	2	3	5	4.17
	Subtotal		6	9	15	12.50
VAS > 0		1—2—3	2	2	4	3.33
		1—3—2	2	3	5	4.17
	3 points (sequence)	2—1—3	1	1	2	1.67
		2—3—1	7	2	9	7.50
		3—1—2	2	1	3	2.50
		3—2—1	7	3	10	8.33
	Subtotal		21	12	33	27.5
Total			77	43	120	100.00

F = female; M = male; VAS = Visual Analog Scale.
* Identification of points: 1 = LI4; 2 = ST44; and 3 = Cv23.

in promoting dental analgesia. Moreover, at this acupuncture point, patients reported the sensation of *De qi* as a tingling, as though the jaw had been anesthetized.

Point ST44 alone did not reduce pain intensity, although the stomach meridian, Yang Ming (foot) goes through the face and to be the Ying point that promotes the free flow *Qi* and pain relief [18,24]. This differed from the literature [12,25], in which it was reported that ST44 is a point of great analgesic importance, designed to treat acute pain.

According to the literature [5], the therapeutic effect of each point has been defined, and they can be combined with other points to perform a specific treatment, as in this study, when we used CV23, ST44, and LI4.

In this study, needle insertion was unilateral on the side of the pain reported by the patient, in agreement with another study [12] that evaluated the use of acupuncture for postoperative pain control in third molar surgery. In this case, the acupuncture needle was inserted on the side of the extracted tooth. In the mentioned study, the participant's eyes were covered during treatment in both the placebo and acupuncture groups. Those in the placebo group were not needled and treatment received was tapped with plastic tubing in areas near the acupoints chosen for the acupuncture group. Pain parameters in the acupuncture group were observed to be significantly improved postoperatively. The ideal time for acupuncture has been shown to be the time immediately after the operation [12].

In our study, due to individual variation, we were unsuccessful in applying acupuncture in 2.5% of patients, a result that differs from another study, in which the value was 10% [13].

During the study no patient had adverse reactions to the treatment, however, the literature [16] reports that 7—11% of patients treated with acupuncture, have adverse reactions such as sweating, dizziness, drowsiness, and bleeding. In our clinical practice, we consider it important to note the number of needles inserted and the related acupoints, so that all are removed at the end of the session.

In this study, more women (64.17%) sought the assistance of emergency services when compared to men (35.83%); preventive health habits are more associated with women.

Most patients (99.17%) would recommend acupuncture therapy to another patient in the same situation, in agreement with another study [26], which evaluated patients with problems of temporomandibular disorder treated for 18—20 years. Patients who received acupuncture, occlusal splint, and other therapies (physiotherapy, drugs, etc.), said they would recommend the treatment to another patient with similar complaints.

The study sample did not meet the external validity of the results; we cannot infer that the results apply to the

whole population, because of the small sample size, and we could not split the group by gender.

It is recommended that in further studies, the professional who performs the acupuncture should not be the same as the one who performs the data collection, and that studies should be conducted to evaluate the duration of the effect of acupuncture, which was done in this study.

Pain that leads to a patient seeking emergency dental care can result from various diseases or dental, oral, and facial conditions, or those in nearby structures, therefore, the use of drugs should be restricted to situations of real necessity [3] and should be indicated by the dentist after his diagnosis. Therein lies the importance of pain control in pre-service therapy practice, using a simple, low cost technique, without any adverse effects, for the benefit of the patient awaiting conventional treatment.

In conclusion, the results of this study indicated that the effects promoted by acupuncture analgesia could be a technical adjunct to pain control in patients with acute dental pain, contributing to the restoration of health with social benefit. However, further studies are needed to increase the understanding of its effects.

Disclosure statement

The author affirms there are no conflicts of interest and the author has no financial interest related to the material of this manuscript.

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